

In the Drawings

A duplicate copy of Figure 1 is submitted herewith. It had already been marked to include the legend "Prior Art", which may have been over-looked by the Examiner.

Remarks

Referring to section 2 of the Office Action, the Examiner will note that Figure 1 of the drawings already incorporates the legend "Prior Art" as requested.

Referring to sections 4 and 5 of the Office Action, applicant submits herewith a new Abstract in replacement of the present Abstract. It is believed that the new Abstract meets the specified requirements for form, language and content.

The claims have been amended where appropriate to replace any acronyms by their full corresponding terms thereby addressing the informality objection of section 3 of the Office Action.

Referring now to remaining sections of the Office Action and, in particular section 7, the Examiner will note that all of the independent claims have been amended to the feature that the data stream to be equalized is generated from a plurality of space time coded (STC) data streams received from a plurality of transmit antenna elements.

While prior art reference DiToro (US4058713) does disclose converting a received message signal and a test signal to the frequency domain via Fast Fourier Transformation (FFT) in order to equalise the received message signal in the frequency domain prior to re-transforming the resultant equalised message signal back to the time domain, it does not disclose a method of equalizing a received message signal where said signal is generated from a plurality of received data streams received from a plurality of transmit antenna elements and where said data streams are space time coded (STC) data streams.

In the equalization method of DiToro, the message signal is received from a single antenna element and thus comprises a single, partitioned signal stream transmitted in burst or frame by frame form. Each frame comprises the message followed by a test signal. It is necessary in the method of DiToro to avoid overlapping the received message frames and the test signals due to the dispersion, i.e. time-spreading, encountered in the communications channel carrying the message frames and test signals. This is achieved by providing time gaps between the message frames and test signals (Abstract). The time gaps provided between the message frames and test signals are such that, notwithstanding the time-spread encountered in the transmission process, the bursts (message frames and test signals) do not overlap in time at the receiver (column 3, lines 59 to 66). In other words, the time gaps must be made sufficiently long to account for the maximum possible time-spread that may be encountered by the message frames and test signals in order to ensure that no overlapping of the bursts occurs at the receiver.

In contrast, the present invention comprises a method (claim 1) of equalizing a data stream received over a dispersive communications channel from a plurality of transmit antenna elements, where said data stream is generated from a plurality of space time coded (STC) signals. It should be noted that space time signalling was first mooted circa 1998. Space time coding (STC) and, in particular, space time transmit diversity (STTD) was proposed for mitigating the effects of fading and colouring of a non-dispersive communications channel (present application, page 2, line 30 to page 3, line 3). In STC, at least two data (symbols or chips) streams are transmitted at the same time from different, respective antenna elements. Hence, the at least two STC data streams are formed in both time and space. In the case where there are only two STC data streams, one data stream is formed from the complex conjugates of the symbols comprising the other of the data streams. Consequently, it is inherent in such an arrangement that dispersion in the communications channel will result in time-overlapping of received signals and training sequences in the between the data streams and even within such streams.

However, despite this, in the present invention it has been found to not be necessary to insert time gaps into the transmitted STC data streams as required by DiToro.

The present invention therefore proposes using space time coding in a dispersive communications channel contrary to received wisdom in the field of STC and STTD in order to equalize a received signal. A skilled person would not seriously contemplate modifying the Applicant Admitted Prior Art (AAPA) which utilises STC in a non-dispersive communications channel with the equalization method disclosed in DiToro for a number of reasons. The equalization method of DiToro is applicable to a single, partitioned signal transmission over a dispersive communications channel in which time gaps are inserted between message frames and test signals. It is a straightforward process to determine the maximum possible time-spread that would be encountered by message frames and test signals in a communications channel carrying a single transmission signal and to then partition said transmission signal to insert time gaps sufficiently large to mitigate the effects of dispersion in the communications channel. However, in a dispersive, i.e. time-spreading, communications channel, it is inherent that simultaneous STC data streams received at a receiver will result in overlapping of message signals and training sequences at least between the data streams. This problem is exacerbated in an exponential fashion as the number of simultaneous STC data streams increases from two. Consequently, the insertion of time gaps into any or all of the streams will not prevent overlapping of message signals and training sequences. Therefore, a skilled person would not find motivation in DiToro to modify the AAPA using the arrangement disclosed in DiToro to arrive at the method of the present invention in view of the apparent inability to insert effective time gaps into the plurality of STC data streams.

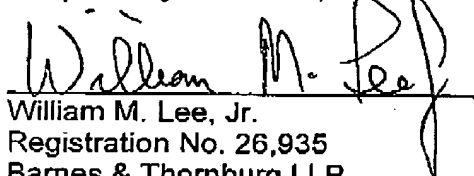
Applicant submits that it is only possible to arrive at the method of the present invention as defined by independent claim 1 starting with the AAPA and in view of DiToro through the impermissible use of hindsight.

The method of the present invention makes a useful contribution to the art of STC and STTD in that it provides a computationally simpler method of equalizing a communications channel that those conventionally employed in the art of STC and STTD and without the need to insert time gaps into transmitted data streams leading to slower processing times inherent in the process of DiToro.

The foregoing submission is applicable to all independent claims of the present application. Consequently, it is considered that the claims of the present application define an invention that is patentable over the AAPA in view of DiToro. Favorable reconsideration of the claims submitted herewith is respectfully requested.

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Respectfully submitted,



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